Dry-Cleaning Fluids

VIRTUALLY every piece of metal handled in industry, and this means every piece of metal in military equipment, must be thoroughly cleansed before it takes finished form.

Were it not for synthetic cleaning fluids made from chlorine, metal cleaning would be a serious bottleneck in the all-out victory program. Lacking these fluids in quantity now, the enormous volume of goods necessary to ultimate triumph would flow at a slower rate.

According to E. I. du Pont de Nemours, permanent adhesion of any finish and satisfactory inspection require perfect cleansing of the metal parts. Oils, greases and the like must be removed after machining, polishing and other operations in preparation for painting, bonderizing and similar finishing processes.

Fluids made from chlorine are familiar to the chemist as chlorinated solvents, to the layman as synthetic dry cleaning fluids, and to the metal worker as chemicals used in cleaning their materials by a process called "solvent degreasing."

Precious parts vital to military equipment can be cleaned in large volume by solvent degreasing with great efficiency. The method cleans metal completely, leaving not one trace of oil. Moreover, the cleaning is carried out at a very fast pace, and the equipment requires very little factory space.

Astounding are the increases in consumption of these synthetic fluids by leading military equipment manufacturers during the past three years. Seven manufacturers used two and one-half times as many pounds in 1940 as they did in 1939, and they more than doubled their 1940 consumption during 1941. These figures represent an over-all increase of 5000 per cent in three years.

An accurate barometer of the accelerating victory program, the figures help explain why a shortage is threatened in the odorless, non-flammable synthetic fluids used to clean clothes.

Properly to appreciate the import and significance of these mounting figures is to know something of the history of metal cleaning. Tumbling in sawdust, sandblasting, and just plain scrubbing by hand with soap and water are other methods which have been used at times and on occasion discarded by industry for one reason or another.

As old as soap itself, alkali washing still is the most extensively used. It is comparable with dish washing in the home, except that alkali compounds are substituted for soap. A metal part is dipped or tumbled in or sprayed with alkali solution often enough to wash off extraneous matter. An automatic alkali washer for large metal parts that are very dirty has several tubs or spray units and sometimes one or two drying units.

Long an established cleaning process, the advantages of alkali washing are many. The alkali solutions are inexpensive and the washers, big or small, last for years. One of the first commercial metal cleaning machines, installed at an automobile plant in 1919, still does yeoman service. It is the method most often used for cleaning sheet metal rolling from a mill at speeds in excess of 300 ft. per min.; and it still is the least costly cleanse for certain ordinary metal parts.

Principal among its shortcomings is the threat of the solution etching and ruining precision parts that are die-cast from certain now highly important metals. Such parts, made in all sizes for varied military equipment, were little used in World War I, and these few were cleaned by hand with petroleum products such as oleum spirits, naptha and kerosene. These metal parts must be wholly clean before finishing, and solvent degreasing has been particularly efficient in cleaning them thoroughly at mass production rates.

Alkali washers are large and take up considerable floor space, for very dirty metal must be exposed the alkali solution for a long time. And after the wash, it must be dried before finishing processes such as painting. Sometimes the washes are not thorough, leaving stains, spots, marks, runs, and streaks on the metal part. Another fault is that the not so accessible portions of complicated metal parts are difficult to cleanse.

In cleaning metal with petroleum products, each part has to be dipped into successive baths, because the petroleum cleanser soon becomes contaminated. This makes the bath slow, costly and not always efficient. Too, these cleansers are hazardous to handle because they are inflammable and explosive; therefore laws restrict their use. They did, however, meet the small need for cleaning certain metal parts without damage during the first World War.

In solvent degreasing, a dirty metal part is either diped, sprayed or tumbled in the chlorinated solvent trichlorethylene, or it is rinsed in a vapor from this chemical, much as a person takes either a tub, shower or steam bath. Oil and grease on the metal are dissolved by the fluid or its vapor just as water dissolves sugar. No scum is left on the solvent as the oil or grease is dissolved. The solvent runs off the metal readily, which dries almost instantaneously. Quantity and type of dirt determine the extent of the cleanse. If the metal is very dirty, the tumbling and dipping action helps like scrubbing. A vapor rinse is always the final step, because vapor which condenses on the metal contains no contami-

Fifty-first in a Series of Articles on the Technical and Economic Aspects of Metal Cleaning and Finishing

Speed Arms Production

when the metal is oily but not very dirty.

In alkali washing, however, dirt is largely removed by mechanical action. Alkali emulsifies mineral oils and reacts with vegetable oils to make a soap which, in turn, emulsifies these oils. But the emulsified oil remains on the surface of the bath, and metal is contaminated when it is lifted from the bath. That is why solvent degreasing, with the final rinse in uncontaminated vapor, is so satisfactory when thorough cleaning is necessary.

Germany discovered this cleaning method during World War I. Crude solvents were poured unheated into a tub, and the metal part was placed in successive tubs of cold fluid to assure the best possible cleanse. Sometimes a single metal part was placed in seven successive baths. Development of this method was taken up in England. England and Germany both arrived at the idea of a hot fluid and vapor rinse about the end of World War I. During the '20s, England, Germany, France, Belgium, Sweden, and Norway cleaned metal this way. Their equipment was small and very expensive, certainly not adaptable to mass production by the American standards.

Carrier Engineering Co. brought the first degreasers to this country about 1928. It built several degreasers like those from abroad, but soon realized they were too expensive for production-line cleaning. However, Carrier deserves credit for pioneering solvent degreasing in this country. Roughly one hundred of these units are still operating.

During the early '30s, G. S. Blakeslee & Co., of Chicago, and Detroit Rex Products Co., of Detroit, now the chief manufacturers of degreasers, entered the picture. Rex had been working with solvents for 8 or 10 years, and had developed a process for cleaning automobile bodies with a solvent spray. Its own engineers developed a variation of the foreign degreaser after years of work, and patented it. Rex started building degreasers in 1931. It sold two that depression year, the first to a refrigerator manufacturer and the second to an automobile manufacturer.

. . . Invented abroad, solvent degreasing has been adapted to America's mass production methods and tremendously improved by chemists and engineers during the past decade.

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The Blakeslee company first looked into solvent degreasing in Europe in 1929, and in 1932 secured the rights to the German patents of Alexander Wacker. Its first degreaser was placed on exhibit at the Steel Show in Buffalo, N. Y., on Oct. 1, 1932, and was sold to Ralco Mfg. Co. for cleaning small electrical parts. This first Blakeslee degreaser was 36 in. long, 18 in. wide, and 45 in. high.

Du Pont had been ready for some time to supply trichlorethylene, which to this day remains as the principal solvent used. But even with a comparatively inexpensive degreaser adapted to fast production lines and an ample supply of solvent, the equipment manufacturers faced an up-hill job in selling the new method. Solvent degreasing was so entirely foreign to traditional ideas and conceptions of metal cleaning that industrialists listened skeptically to the claims made for it. Even when the process was demonstrated to be successful, they were slow to purchase equipment. It was a matter of getting some degreasers installed in key plants, and letting them "prove themselves." They did and solvent degreasing was fairly well established in two years' time, and growing steadily.

More and better cleaning in less space, and cleaning of precision parts on a mass production basis, are the outstanding advantages claimed for solvent degreasing. It has others, hardly less important. A degreaser requires only a quarter as much heat as a comparable alkali washer. If operated efficiently, solvent degreasing is competitive in costs with all other methods; for some work it is much less costly. Degreasers can be used in small shops of all descriptions and garages where space and cost prohibit alkali washers. The fluids may be reused time and again, the only loss coming from diffusion and inefficiency.

Since 1932 solvent degreasing has been used for an increasing number of diversified metal cleaning jobs. Note a few examples of the extent and versatility of this method. Metal drums for shipping grease are themselves degreased when fabricated so that they may be painted. Filaments for radio tubes, roughly the diameter of a hair, are cleaned as well as a 3000-lb. part of a steam shovel. The filaments are mounted on metal trays for their bath in a small degreaser; the huge steam shovel part is dipped into solvent vapor.

Human bones are cleansed of grease and fat in degreasers at the Museum of Natural History in New York, Cornell University and Columbia University before they are used for archaeological and medical studies. Dentures are dewaxed by this process. A degreaser six in. wide and 12 in. long, probably the smallest made, cleans jewels, main springs and tool gages.

Large factory degreasers are most impresive. One 75 ft. long, 20 ft. high and 10 ft. wide, probably the largest ever built, cleans automobile hardware and accessories. There are degreasers to clean beer cans, 3600 coffee percolators per hr., kitchen cabinets, stoves, 4000 to 5000 automobile

(CONCLUDED ON PAGE 124)

More Changes Revealed in WPB Iron and Steel Branch

Washington

• • • **Further reorganization** of WPB's Iron and Steel Branch is under way and important initial changes in personnel were announced last week by Reese H. Taylor, Chief. It is reported that executive consultants whose activities have been of an advisory character will be given operating assignments.

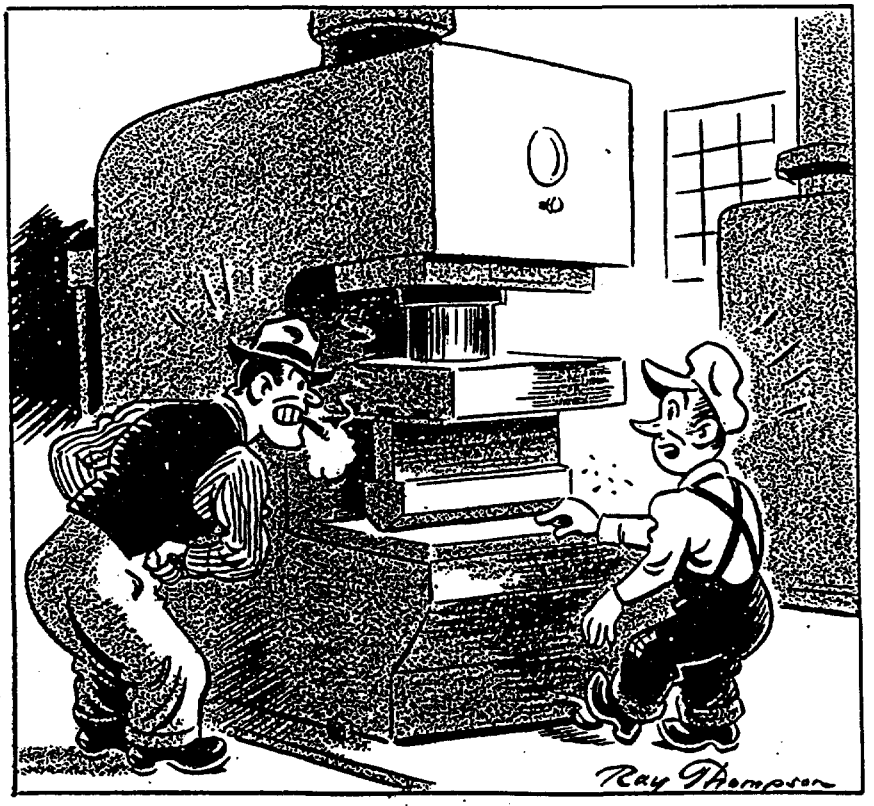
Among consultants who, it is said, will be affected by this shift, are Joseph L. Block, Inland Steel Co.; G. C. Gries, Great Lakes Steel Corp.; Norman W. Foy, Republic Steel Corp.; C. H. Longfield, Youngstown Sheet & Tube Co. and A. V. Wiebel, Carnegie-Illinois Steel Corp. Added to Mr. Taylor's staff of executive consultants is H. Leroy Whitney, who has been a technical consultant on specifications. Another change in the Iron and Steel Branch personnel, it is reported, will be the selection of Oran Fulton, Wheelock, Lovejoy Co. Jobbers, as head of the Alloy Section, succeeding Maxwell Brace.

By changes announced, Charles Halcomb, former chief of the products section, was made chief of the allocations and priorities section, succeeding Stanley B. Adams, who was placed in charge of coordinating PD-25a information for the materials division. Later Mr. Adams will join the bureau of priorities of the division of industry operations. David Austin, executive consultant to the branch, was made chief of the products section.

Before joining the war effort in May, 1941, Mr. Adams was with the Dravo Corp., Pittsburgh. His previous experience included designing and engineering a large steel plant in the Ukraine for the Dnieprostoy Metal Works Russian Commission.

Mr. Halcomb, for the last 17 years Philadelphia district manager for the Proctor & Gamble Co., joined the government in 1941. His home town is Malbern, Pa.

Mr. Austin, vice-president in charge of sales for Carnegie-Illinois Steel Corp., Pittsburgh, came to Washington in January of this year.



***"How many times have I told you to cut your nails at* home?"**

New Douglas Aircraft Plant for Midwest

Chicago

• • • **Construction of a new Douglas Aircraft Corp. plant in the greater Chicago area is expected to get underway immediately. This new plant, the fifth to be built by Douglas, will cost approximately $20,000,000 and will employ 15,000 workers, according to the Chicago Association of Commerce.**

Dry-Cleaning Fluids

(CONCLUDED FROM PAGE 64)

handles per hr., 25-lb. metal beds, and 3000-lb. roller bearings for steel mills. This type bearing, 30 in. in diameter, formerly required 8 hrs. to clean, but the new cleanse reduces the time to 30 min.

Razor blades, gas meters, motor rotors, wired armatures, electrical switch connections, telephone parts, aluminum strip and foil for insulation, in fact virtually every metal part that can be named, has been cleaned quickly, efficiently, and thoroughly by solvent degreasing.

Eighty per cent of all degreasers are custom built, but retooling for metal cleaning is not necessary in plants converted from civilian to military goods. A degreaser which has been cleaning automobile hardware can with minor adjustments be assigned to cleanse small metal parts of military equipment. Sales of degreasers have jumped during the "defense" and "victory" years. Increased sales, however, do not indicate completely increased use of this method, for most units now are operated on a 16 or 24-hr. basis where formerly they may have been used intermittently during an 8-hr. day.

The victory program has placed a burden on manufacturers of degreasers and chlorinated solvents. Degreasers are being built as quickly as possible and only for military and essential civilian industries. Every ounce of solvent that possibly can be squezed from current equipment and available supplies of chlorine is needed. Indeed, defense requirements for these solvents are far greater than the normal consumption in all civilian industries prior to the war. New equipment for manufacturing both chlorine and trichlorethylene is scheduled to come into production this year, and the trichlorethylene will be needed for degreasing as soon as it is ready.